

SHORT COMMUNICATION

ADDITIONAL NOTES ON THE POST-BIRTH DEVELOPMENT OF THE SCORPION *VAEJOVIS COAHUILAE* WILLIAMS (VAEJOVIDAE)

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ABSTRACT. Fourteen specimens of *Vaejovis coahuilae* Williams 1968 were born in the laboratory and reared in an incubator at a near-constant 27 °C. A single female reached maturity at the 8th instar, as previously hypothesized, but unverified, in this species. Two other specimens reached the 7th instar, but the male died at the molt and the female was not yet mature. Data on the duration and morphometrics of observed instars are provided for all specimens.

Keywords: Life history, instars, Vaejovidae, *Vaejovis*

A study of the life history of *Vaejovis coahuilae* Williams 1968 was published earlier by Francke & Sissom (1984). In that study, three individuals were successfully reared to the sixth instar, with only one (a male) reaching adulthood. Based on comparisons with field-collected adults, the authors used an extrapolation method and a formula-based estimate to hypothesize that males of the species mature at either the sixth or seventh instar and females at either the seventh or eighth. The purpose here is to report new data that validates (at least in part) the hypothesis of Francke & Sissom (1984).

Vaejovis coahuilae is a very common scorpion found in southeastern Arizona, much of New Mexico, western Texas and northern Mexico (Sissom 2000; unpub. data). In the current study, a pregnant female specimen of *V. coahuilae* was collected along Lea County Rd. 21, 15 mi S jct. with NM 128, New Mexico on 24 May 1990 and returned to the laboratory. At the beginning of August, the female was discovered with 29 first instar offspring on her back. The molt to the second instar occurred on 5 August 1990, and the young descended from the mother's back within the next two days. After their descent, 14 offspring were transferred to individual plastic widemouth specimen jars (height, 4.45 cm; inside diameter, 4.76 cm). The specimens in their jars were placed in a tabletop incubator at a near constant temperature of 27 °C. There was no internal lighting in the incubator and the specimens kept there were in near constant darkness, experi-

encing light only during brief periods of maintenance.

All specimens were fed and watered on the same schedule. Food provided included wingless *Drosophila melanogaster* Meigen, field-collected termites (*Reticulitermes* Holmgren sp.), and small mealworm larvae (*Tenebrio molitor* L.), with progressively larger prey being given to later instar specimens. Two circular pieces of paper towel were placed in the bottom of each container to provide shelter and water for the scorpions. Distilled water was provided at least twice weekly by pipetting several drops directly onto the paper towel; the scorpions were frequently observed drinking from the moistened substrate. Care was taken not to oversaturate this substrate to prevent drowning of the young scorpions, and the paper towel was changed periodically. The lids of the jars were loosely replaced so as to allow the humidity inside the jars to subside to normal levels within a day or two.

Twelve of the individuals successfully completed the second instar, but one died during the molt. Only half of those ($n = 6$) survived the third instar, one more died during the fourth instar and two more died during the fifth. Two females and one male reached the seventh instar (the male dying during the molt) and, of the two females remaining, one successfully reached the eighth. The female that later died in the seventh instar was dissected and no development of the ovariole was observed; the eighth instar female, however, was clearly adult.

Table 1.—Growth data by instar for *Vaejovis coahuilae* Williams reared in an incubator at 27°C. Means, minima (min), and maxima (max) are given for raw measurements (in mm). Average growth factors (GF) between instars are also provided. Measurements included carapace length (CarL), pedipalp chela length (ChelaL), pedipalp chela width (ChelaW), metasomal segment V length and width (MetVL, MetVW), and metasomal segment IV length and width (MetIVL, MetIVW). Growth factors for the single specimen reaching the eighth instar were calculated from its 7th instar sizes. Three specimens actually reached the seventh instar. The male died during the molt, and as a result, its cuticle was distorted and probably not expanded.

Instar	CarL	ChelaL	ChelaW	MetVL	MetVW	MetIVL	MetIVW
2nd (<i>n</i> = 12)							
mean	1.33	1.59	0.36	1.21	0.55	0.78	0.55
min	1.23	1.50	0.33	1.12	0.47	0.70	0.50
max	1.44	1.72	0.40	1.30	0.60	0.90	0.60
GF to 3rd	1.24	1.25	1.28	1.28	1.33	1.33	1.29
3rd (<i>n</i> = 6)							
mean	1.66	2.00	0.46	1.55	0.73	1.05	0.71
min	1.55	1.85	0.40	1.45	0.60	0.95	0.62
max	1.86	2.35	0.55	1.80	0.85	1.23	0.82
GF to 4th	1.12	1.13	1.15	1.21	1.15	1.17	1.18
4th (<i>n</i> = 5)							
mean	1.86	2.26	0.53	1.88	0.84	1.23	0.84
min	1.51	1.85	0.40	1.65	0.62	0.97	0.64
max	2.08	2.51	0.60	2.00	0.97	1.35	0.95
GF to 5th	1.27	1.31	1.36	1.28	1.35	1.46	1.35
5th (<i>n</i> = 3)							
mean	2.37	2.95	0.72	2.41	1.13	1.79	1.13
min	2.10	2.70	0.60	2.12	0.95	1.66	0.98
max	2.60	3.20	0.82	2.70	1.30	1.95	1.25
GF to 6th	1.25	1.26	1.29	1.28	1.26	1.17	1.24
6th (<i>n</i> = 3)							
mean	2.99	3.76	0.95	3.16	1.46	2.12	1.45
min	2.75	3.50	0.85	2.89	1.32	1.97	1.31
max	3.15	3.92	1.00	3.30	1.55	2.20	1.55
GF to 7th	1.18	1.21	1.29	1.20	1.25	1.21	1.26
7th (<i>n</i> = 2)							
min	3.42	4.67	1.25	3.80	1.81	2.60	1.79
max	3.94	4.97	1.35	4.05	1.95	2.80	1.95
GF to 8th	1.35	1.36	1.55	1.36	1.37	1.31	1.35
8th (<i>n</i> = 1)							
	4.60	6.35	1.94	5.17	2.48	3.40	2.42

That adulthood in this female was reached in eight instars corroborates the earlier hypothesis by Francke & Sissom (1984) based on the theoretical and indirect methods. Whether or not individuals can mature at the seventh instar as well was not answered in the current study, but it seems likely. In natural populations of *V. coahuilae*, there are "small" and "large" adult males and females that could belong to different instars.

Average instar duration for the incubator-reared litter is as follows: 2nd instar, 150.8 days (110.7 days, if two outliers are excluded; these individuals required 292 and 411 days to reach the 3rd instar,

respectively); 3rd instar, 64.2 days; 4th instar, 95.8 days; 5th instar, 119 days; 6th instar, 422 days; and 7th instar, 835.5 days. It should be noted that in the late summer of 1992, the specimens were transported from North Carolina to Texas and placed in a similar tabletop incubator soon after arrival. Perhaps this disturbance resulted in prolonged late instars for the three surviving specimens.

Morphometric data, including measurements and growth factors for each molt are provided in Table 1. Measurements of carapace length, chela length and width, metasomal segment IV length and width, and metasomal segment V length and width were

taken as shown in Sissom et al. (1990, fig. 11.1). Growth factors were calculated by dividing the dimension of a particular structure at a given instar by its dimension at the previous instar. Growth factors were similar to those reported by Francke & Sissom (1984).

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